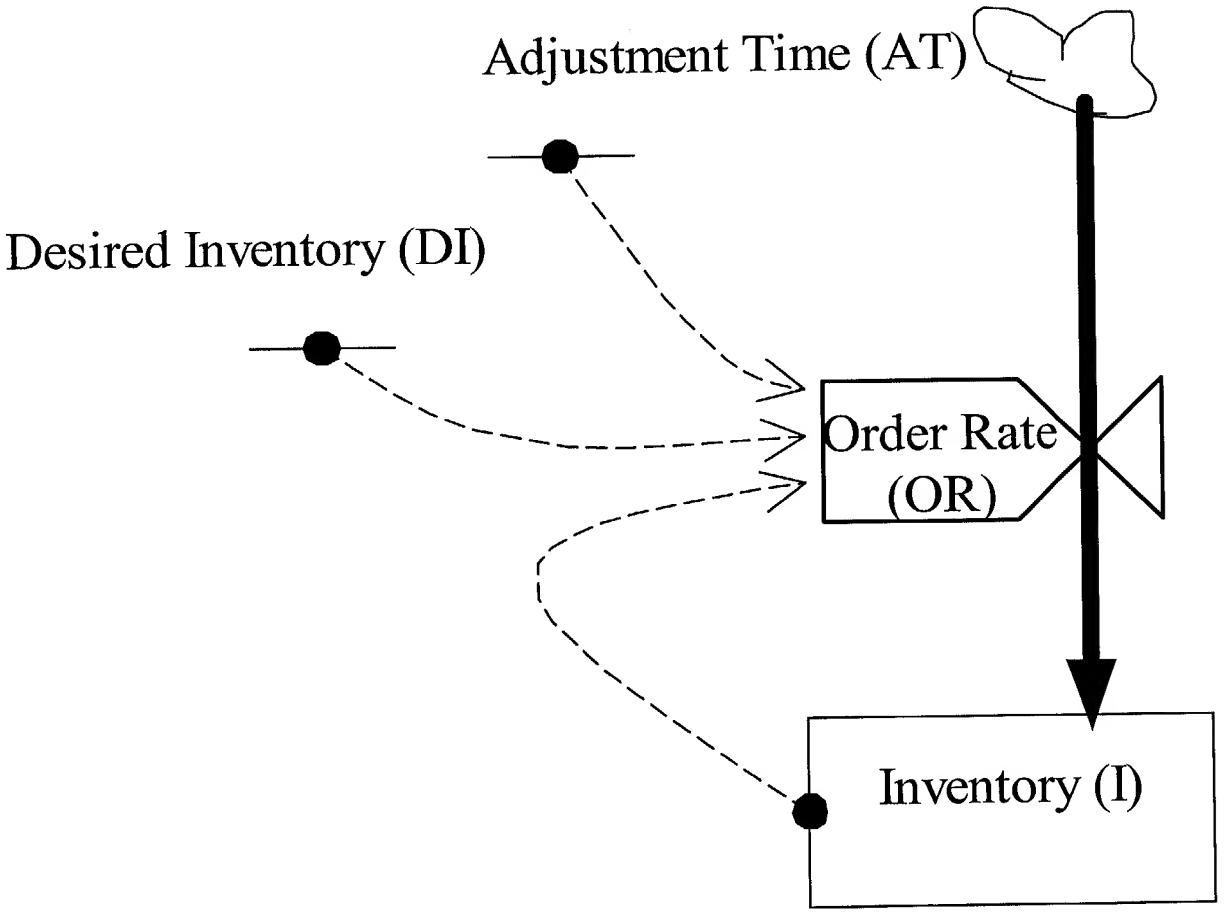


Fig. 1

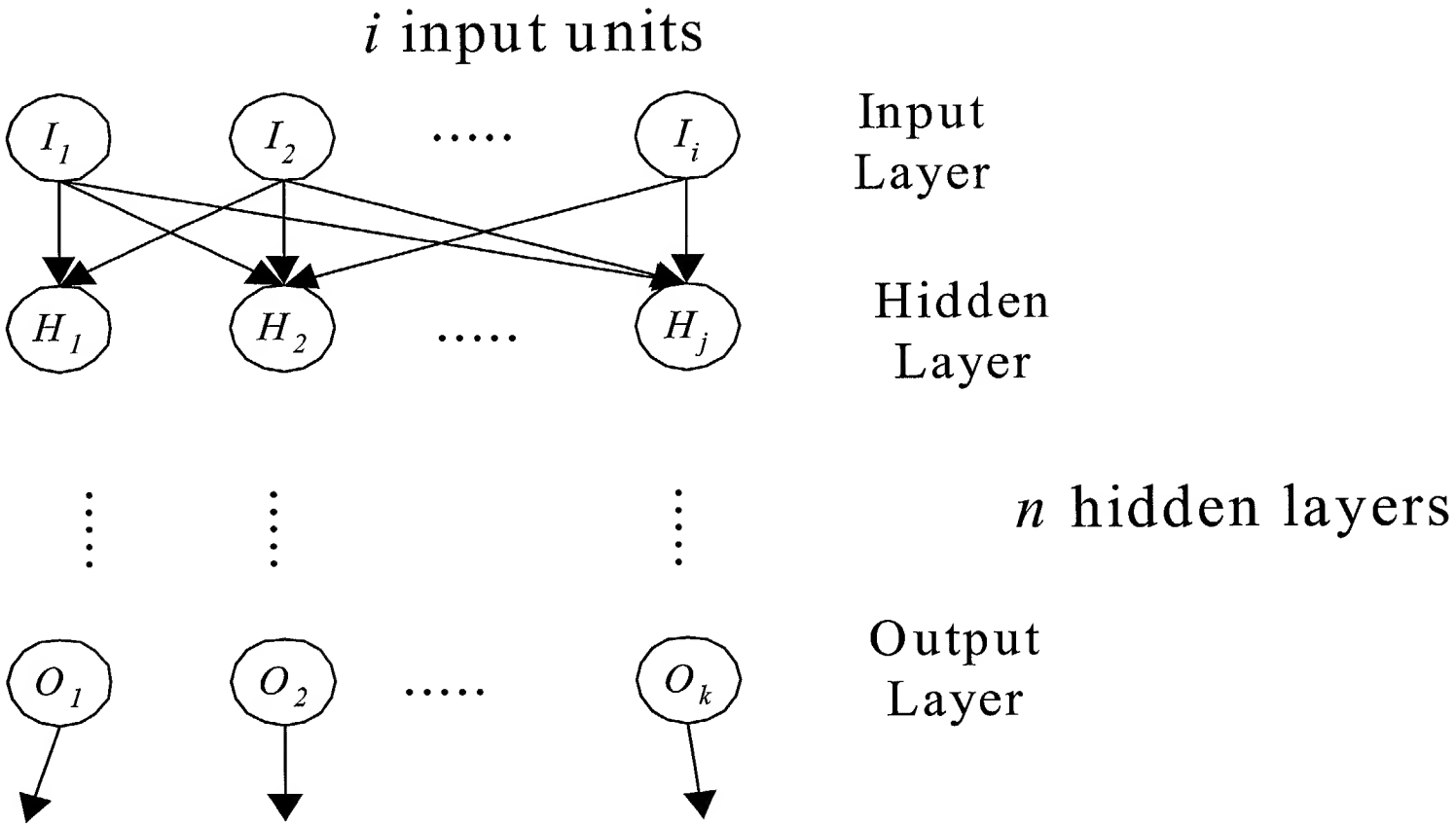
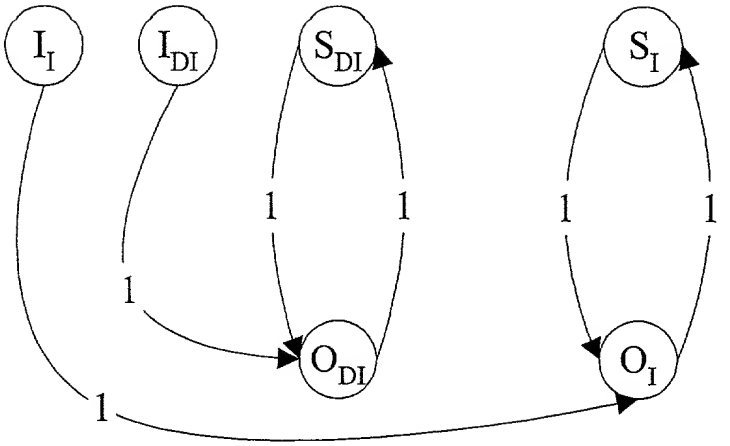

i input units
I1
I2
.....
Ii
Input Layer
H1
H2
.....
Hj
Hidden Layer
n hidden layers
O1
O2
.....
Ok
Output Layer

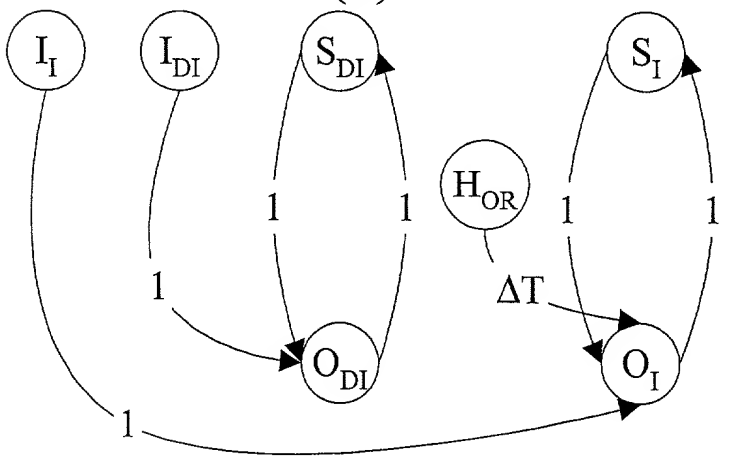
Fig. 2

```
FD2PRN (FD) return PRN
//
//FD: a Forrester's Flow Diagram
//PRN: a Partial Recurrent Network
//Act_IDENTITY: the identity function as an activation function
//Out_IDENTITY: the identity function as an output function
//
Set default activation function Act_IDENTITY
Set default output function Out_IDENTITY
For each level or constant in FD
    Generate an input unit I
    Generate an output unit O
    Generate a state unit S
    Connect a link LIO from I to O
      Set the weight of LIO 1
    Connect a link LSO from S to O
      Set the weight of LSO 1
    Connect a link LOS from O to S
      Set the weight of LOS 1
For each rate DR in FD
    Generate a hidden unit NR
      If the start point of the flow that DR is upon is a level LV1
        Connect a link LHO1 from NR to the output unit corresponding LV1
          Assign the weight of LHO1 with -DT
      If the end point of the flow that DR is upon is a level LV2
        Connect a link LHO2 from NR to the output unit corresponding LV2
          Assign the weight of LHO2 with DT
      For each information source IS in the rate equation DRE of DR
        Connect a link LSH from the corresponding state unit for IS to NR
          Assign the weight of LSH with the coefficient of IS in DRE
```

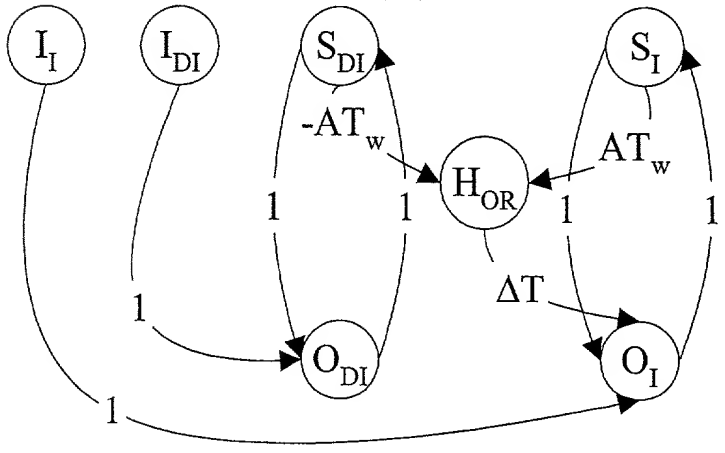
Fig. 3


I_I
I_{DI}
S_{DI}
S_I
1
1
1
1
1
O_{DI}
O_I
1

(a)


I_I
I_{DI}
S_{DI}
S_I
H_{OR}
1
1
1
1
1
ΔT
O_{DI}
O_I
1

(b)


I_I
I_{DI}
S_{DI}
S_I
$-AT_w$
AT_w
H_{OR}
1
1
1
1
1
ΔT
O_{DI}
O_I
1

(c)

Fig. 4

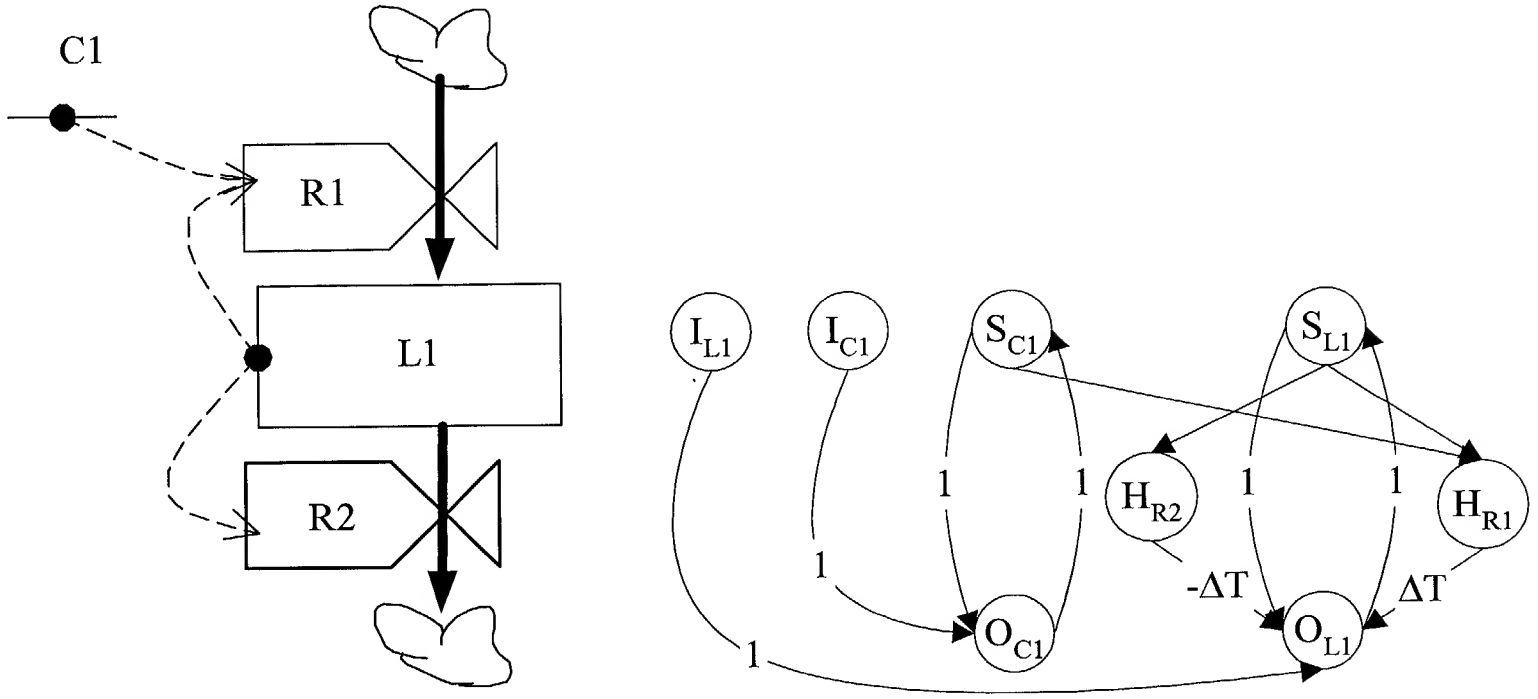


Fig. 5

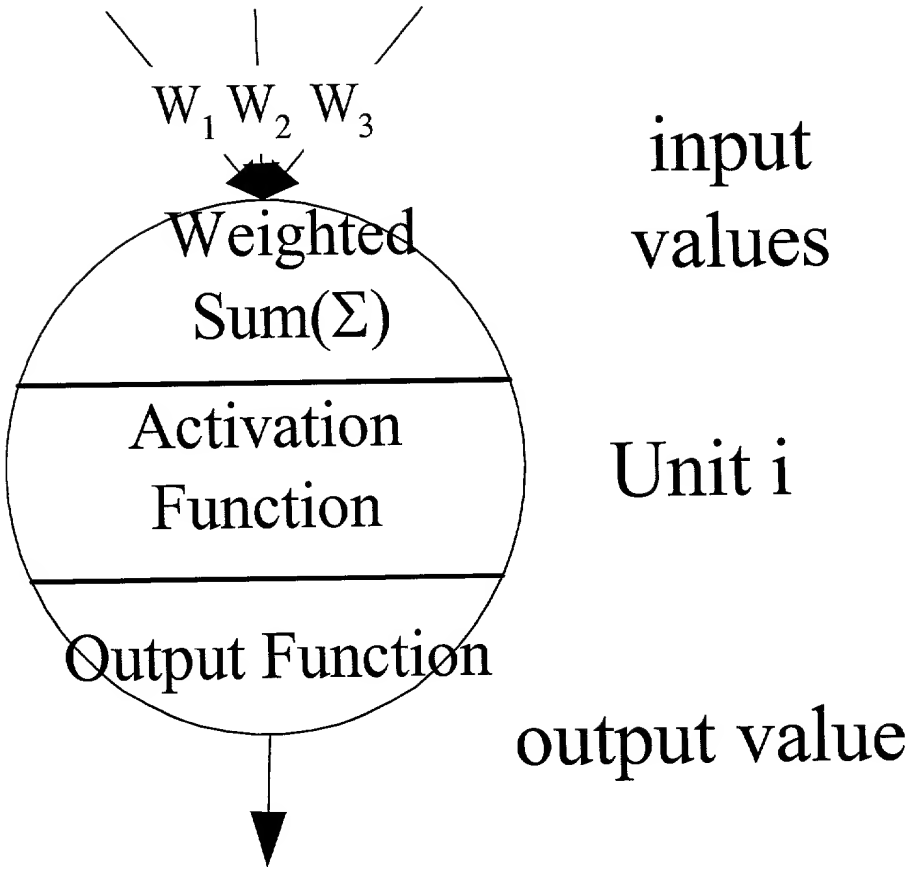

W1 W2 W3
input values
Weighted Sum(Σ)
Activation Function
Unit i
Output Function
output value

Fig. 6

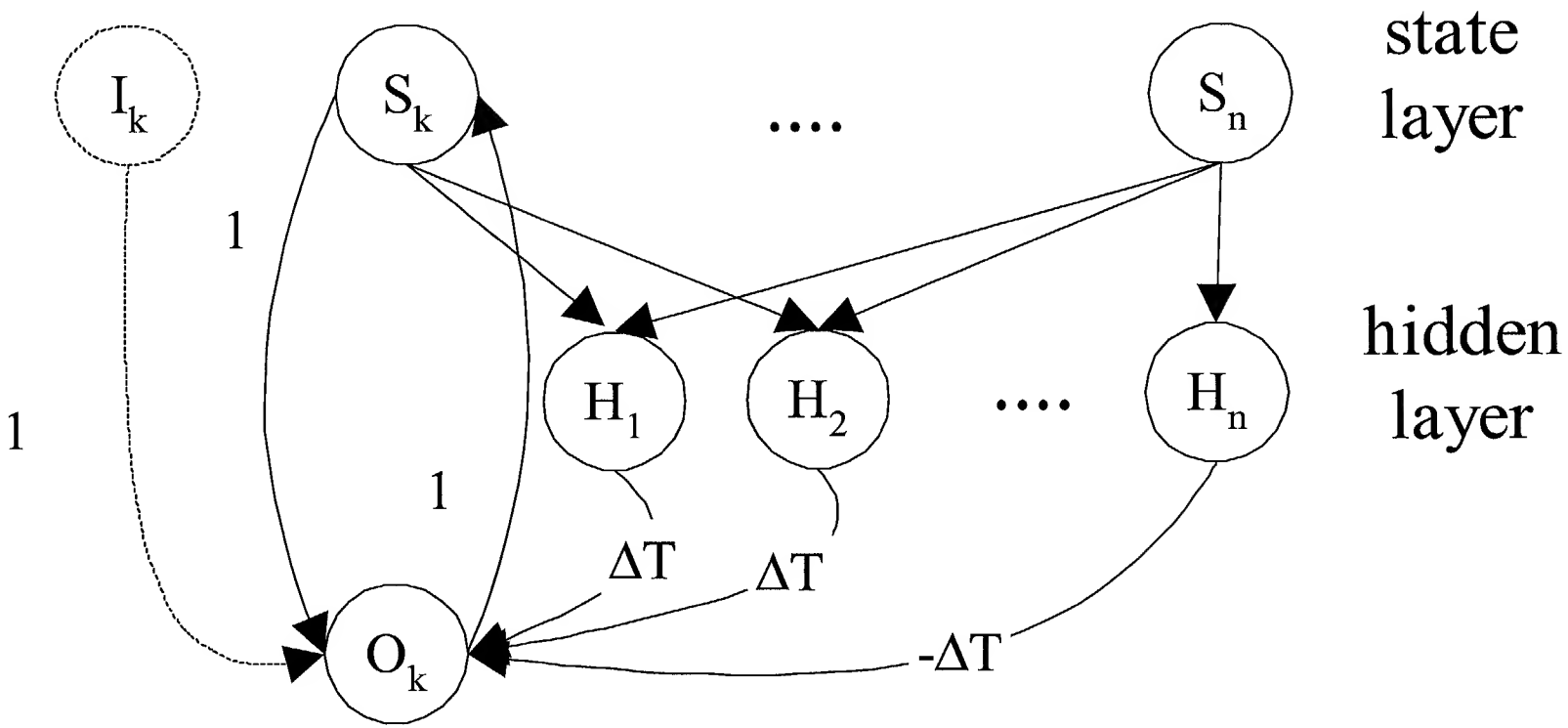


Fig. 7

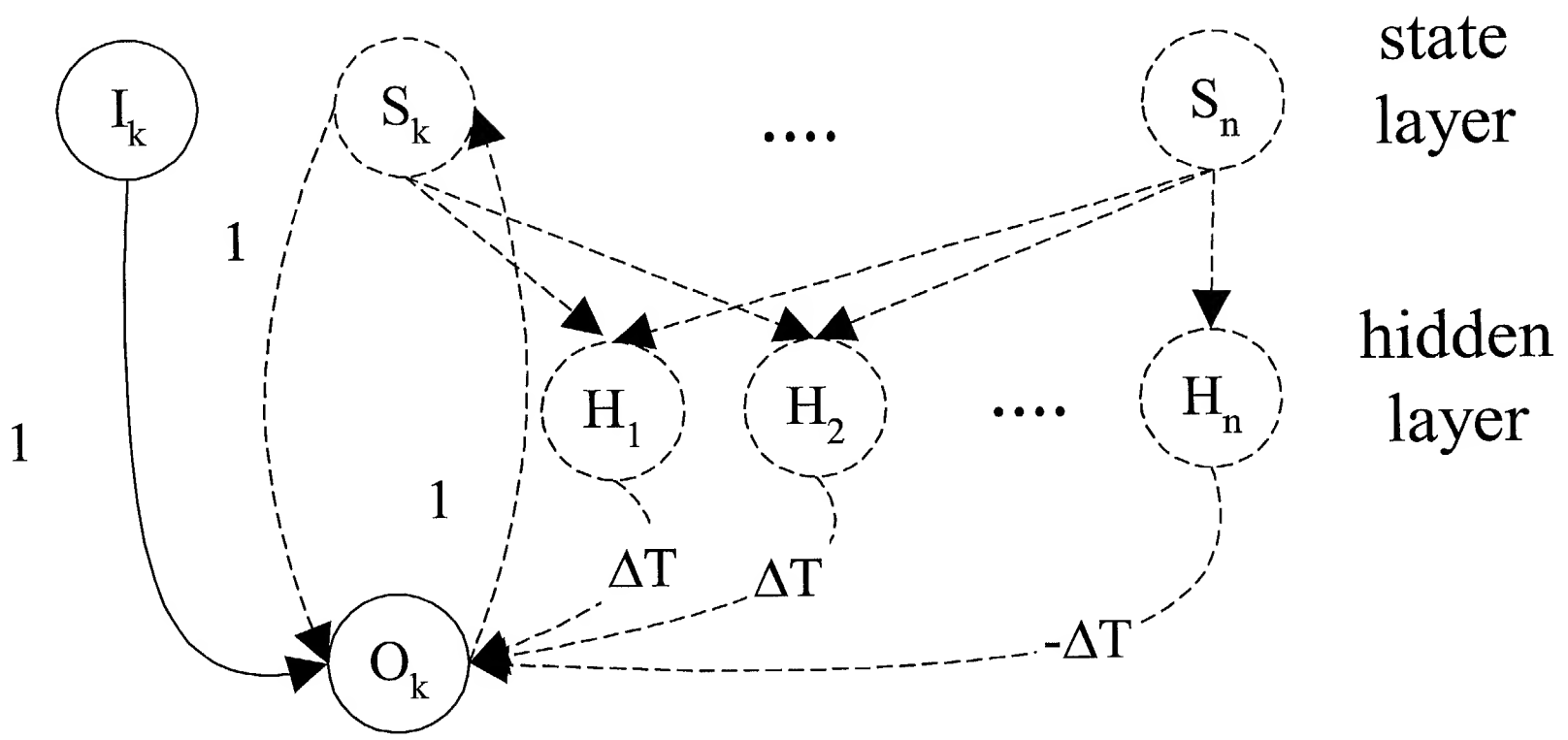


Fig. 8

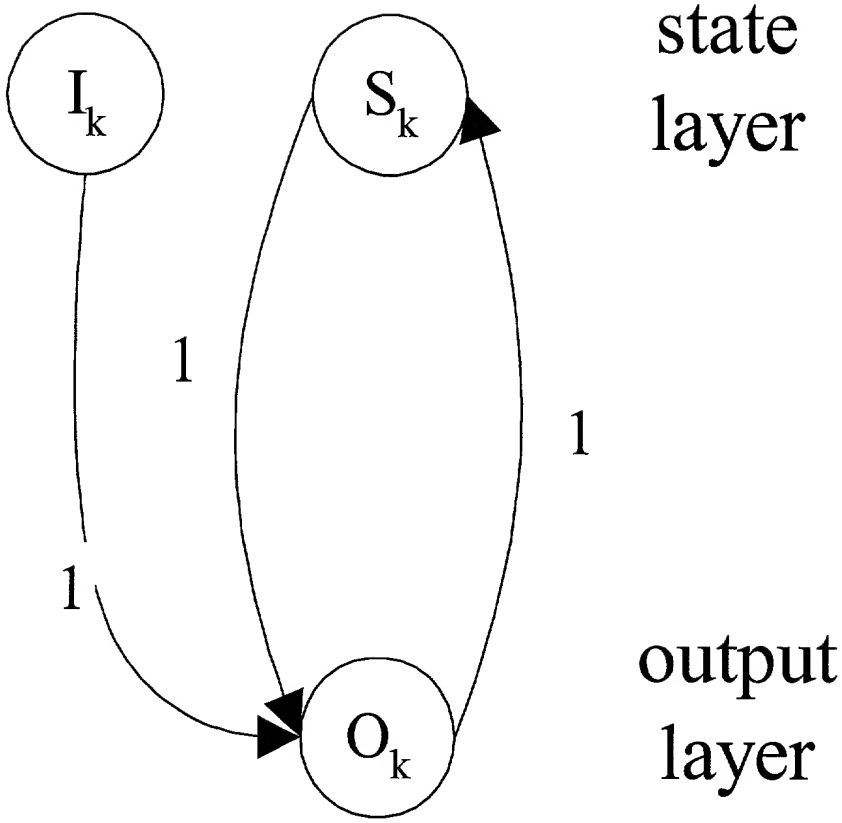


Fig. 9

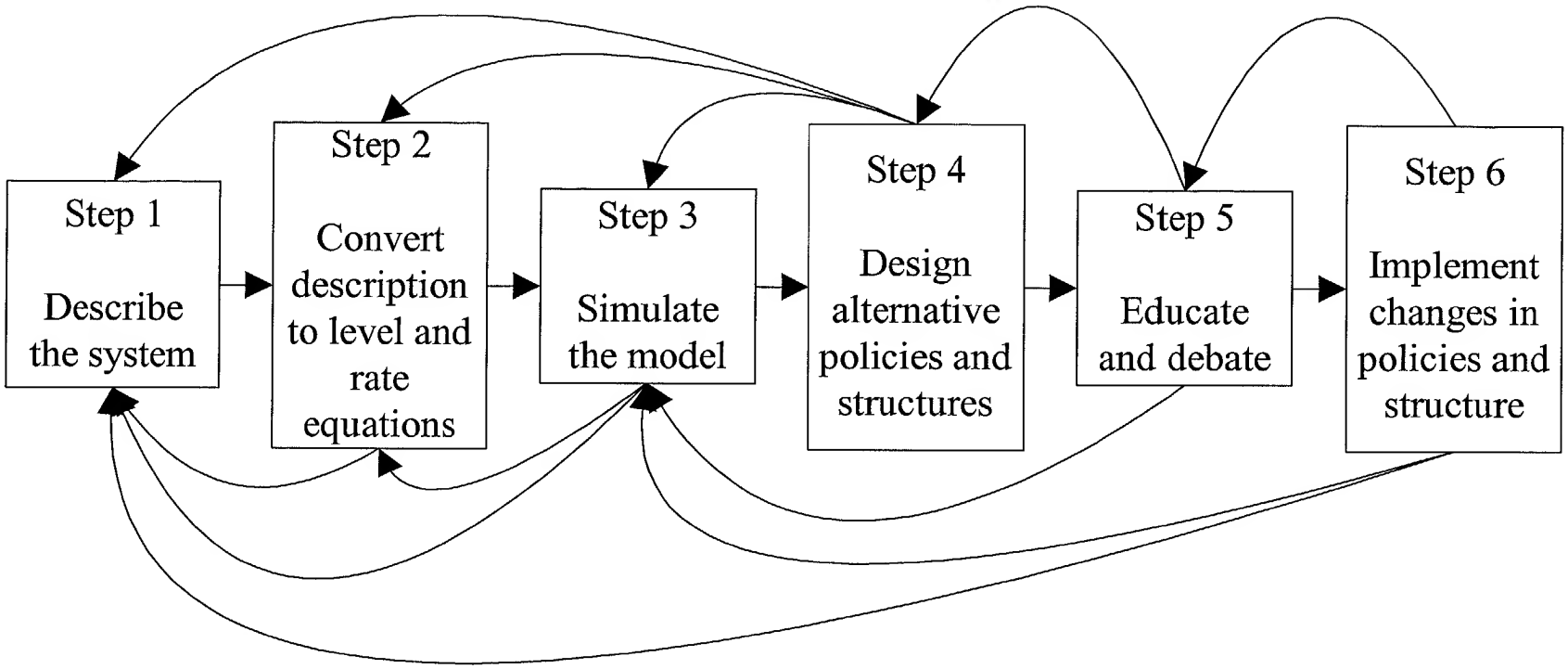

Step 1
Describe the system
Step 2
Convert description to level and rate equations
Step 3
Simulate the model
Step 4
Design alternative policies and structures
Step 5
Educate and debate
Step 6
Implement changes in policies and structure

Fig. 10

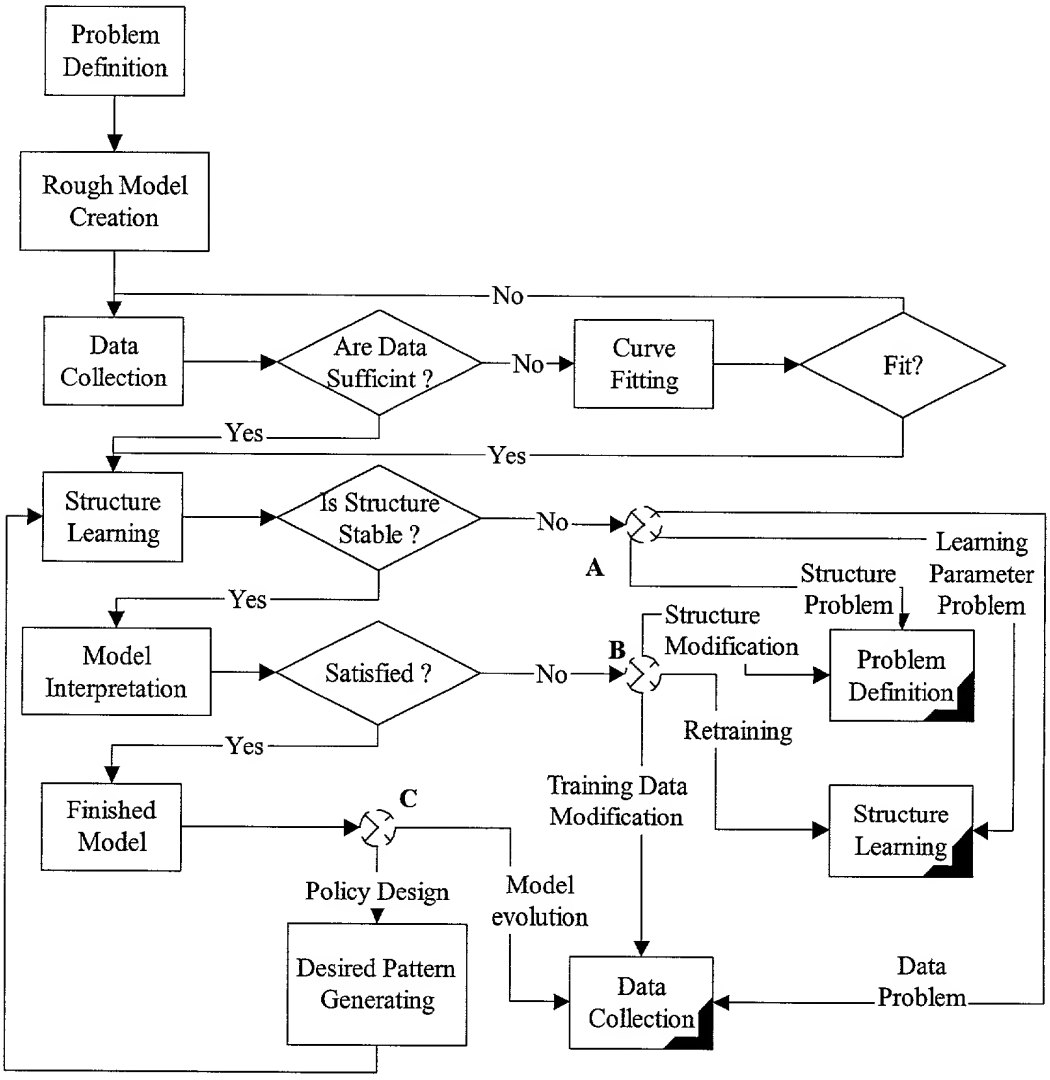

Problem Definition
Rough Model Creation
Data Collection
Are Data Sufficint ?
No
Curve Fitting
Fit?
No
Yes
Yes
Structure Learning
Is Structure Stable ?
No
A
Learning Parameter Problem
Structure Problem
Yes
Model Interpretation
Satisfied ?
No
B
Structure Modification
Problem Definition
Retraining
Yes
Finished Model
C
Training Data Modification
Structure Learning
Policy Design
Model evolution
Desired Pattern Generating
Data Collection
Data Problem

Fig. 11

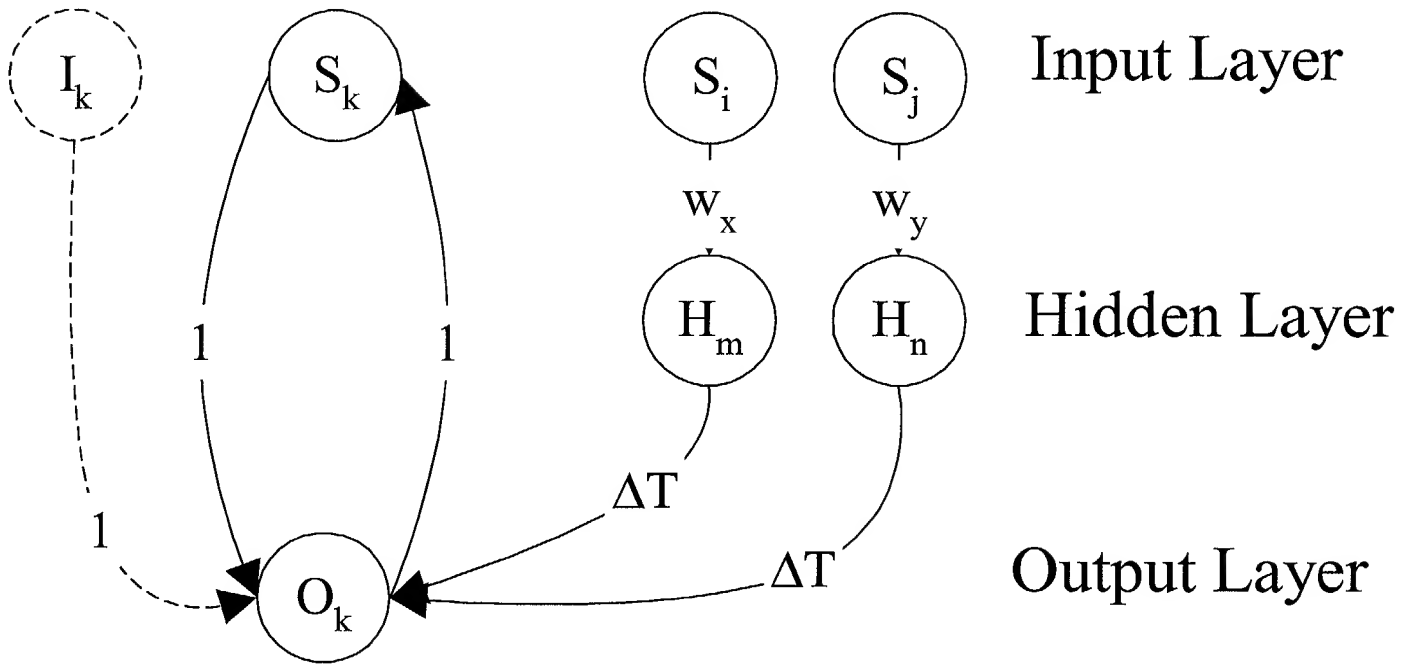

I_k
S_k
S_i
S_j
Input Layer
w_x
w_y
H_m
H_n
Hidden Layer
1
1
1
ΔT
ΔT
O_k
Output Layer

Fig. 12

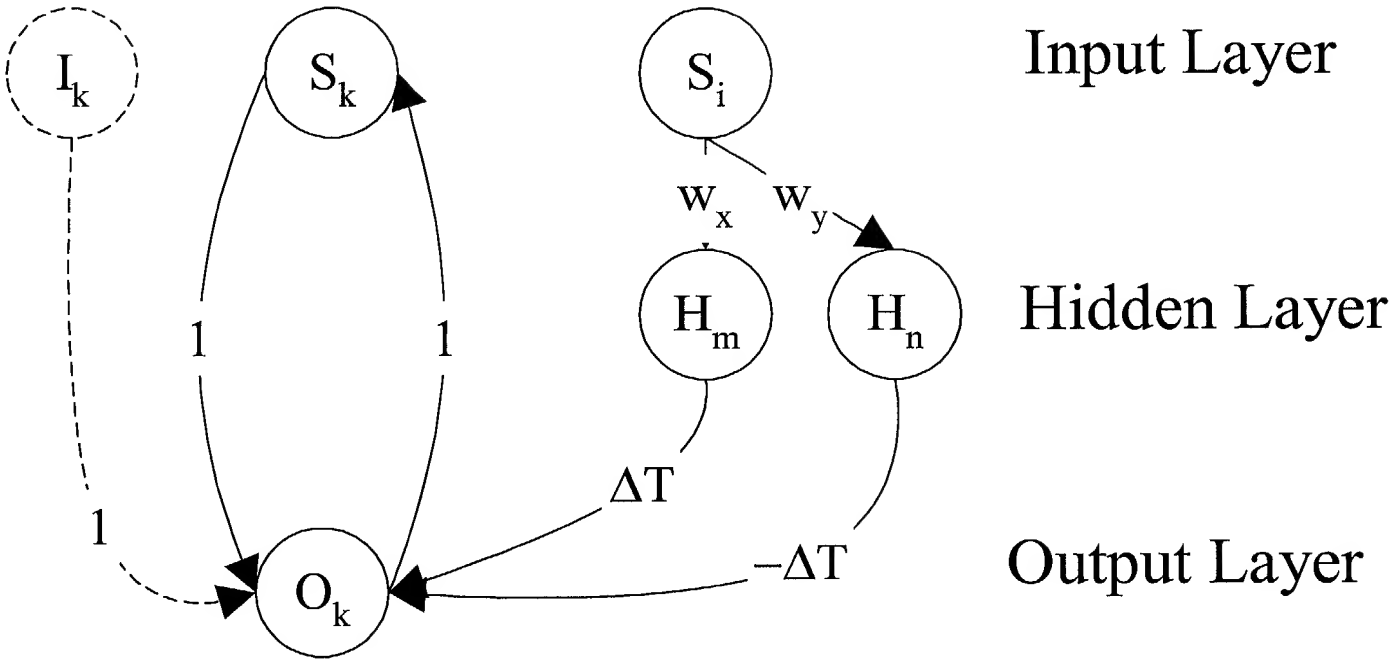
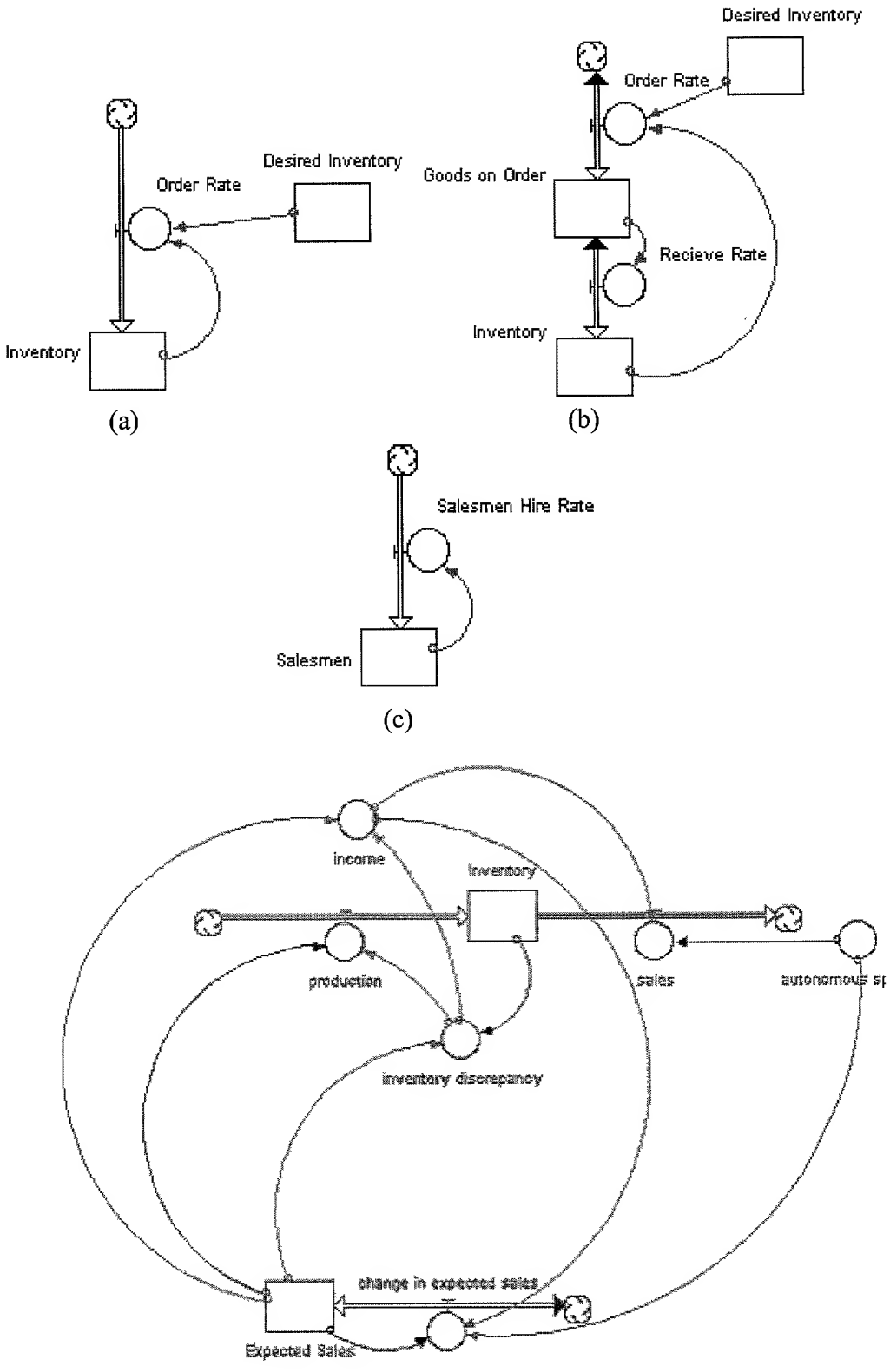


Fig. 13


Desired Inventory
Order Rate
Inventory
(a)
Desired Inventory
Order Rate
Goods on Order
Recieve Rate
Inventory
(b)
Salesmen Hire Rate
Salesmen
(c)
income
Inventory
production
sales
autonomous sp
inventory discrepancy
change in expected sales
Expected Sales

(d)

Fig. 14

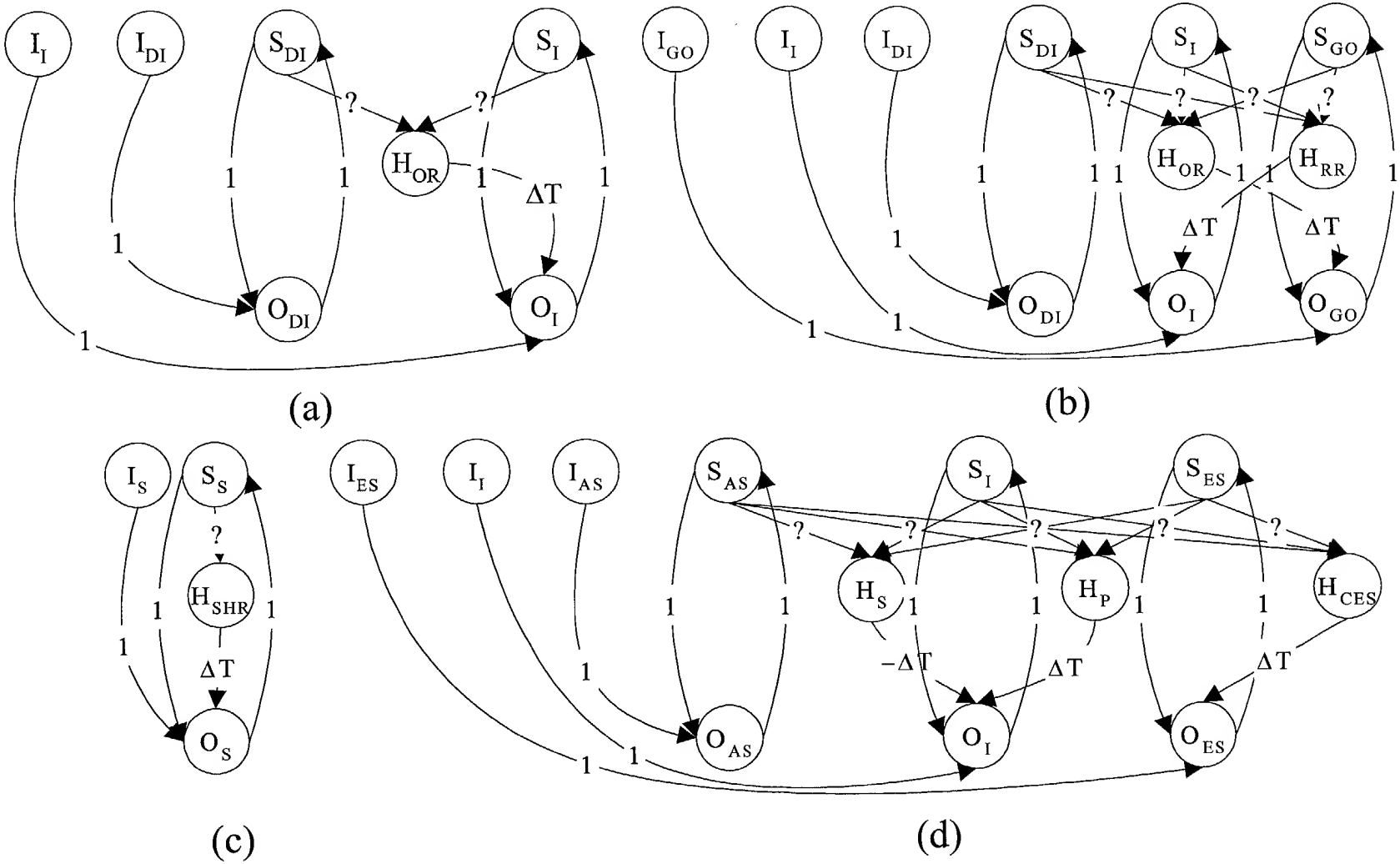


Fig. 15

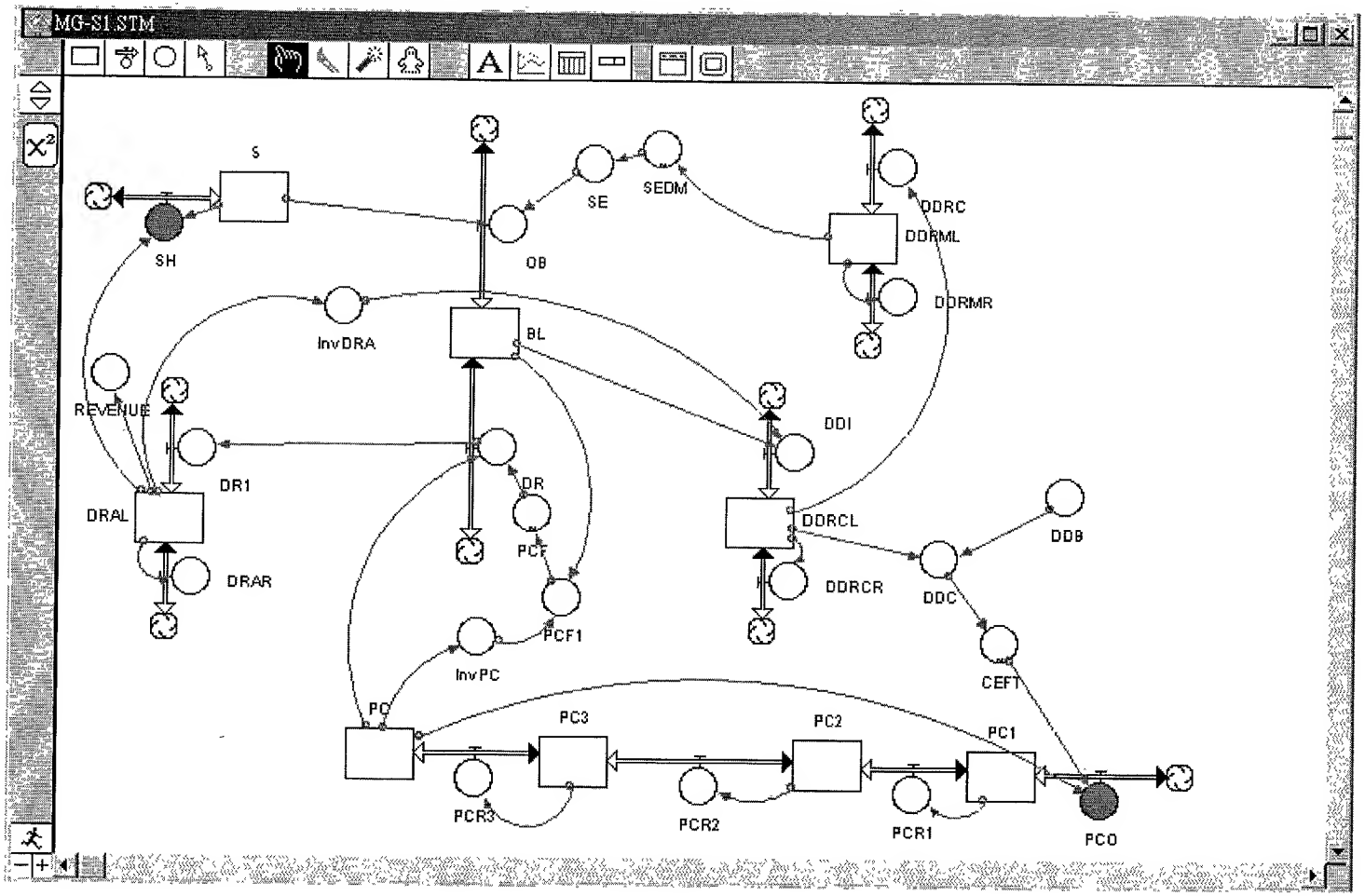


Fig. 16

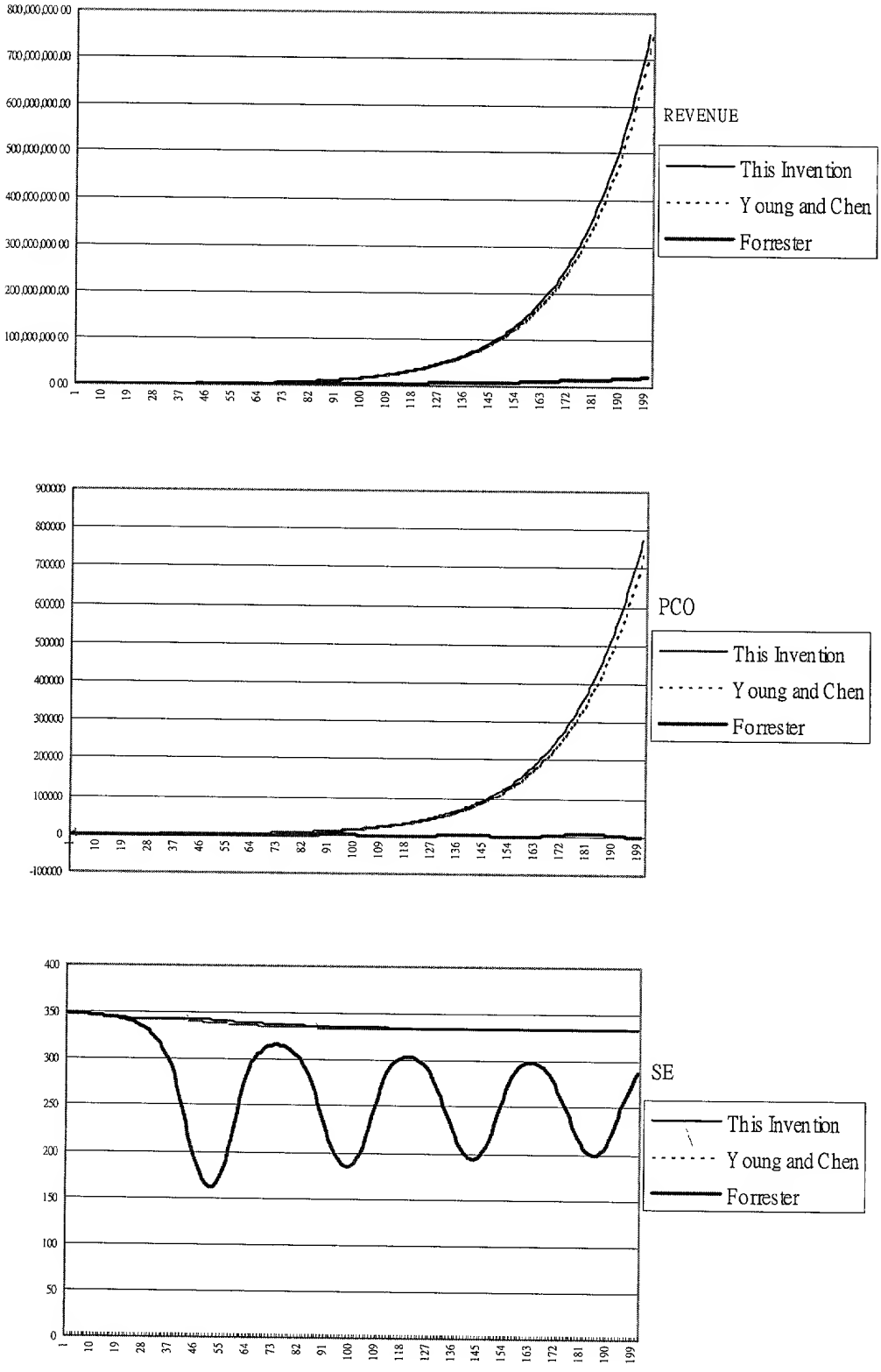

REVENUE
This Invention
Young and Chen
Forrester
PCO
This Invention
Young and Chen
Forrester
SE
This Invention
Young and Chen
Forrester

Fig. 17

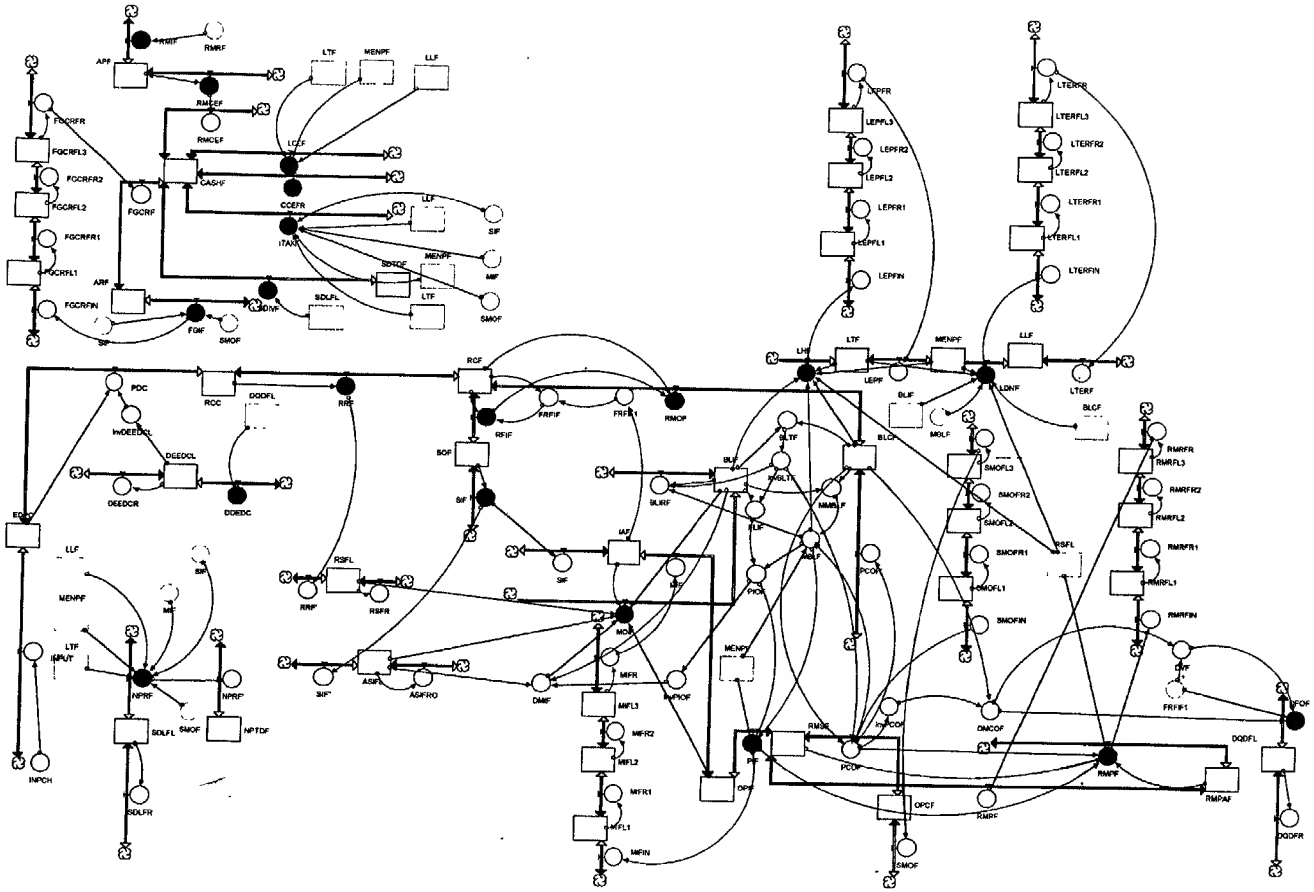


Fig. 18